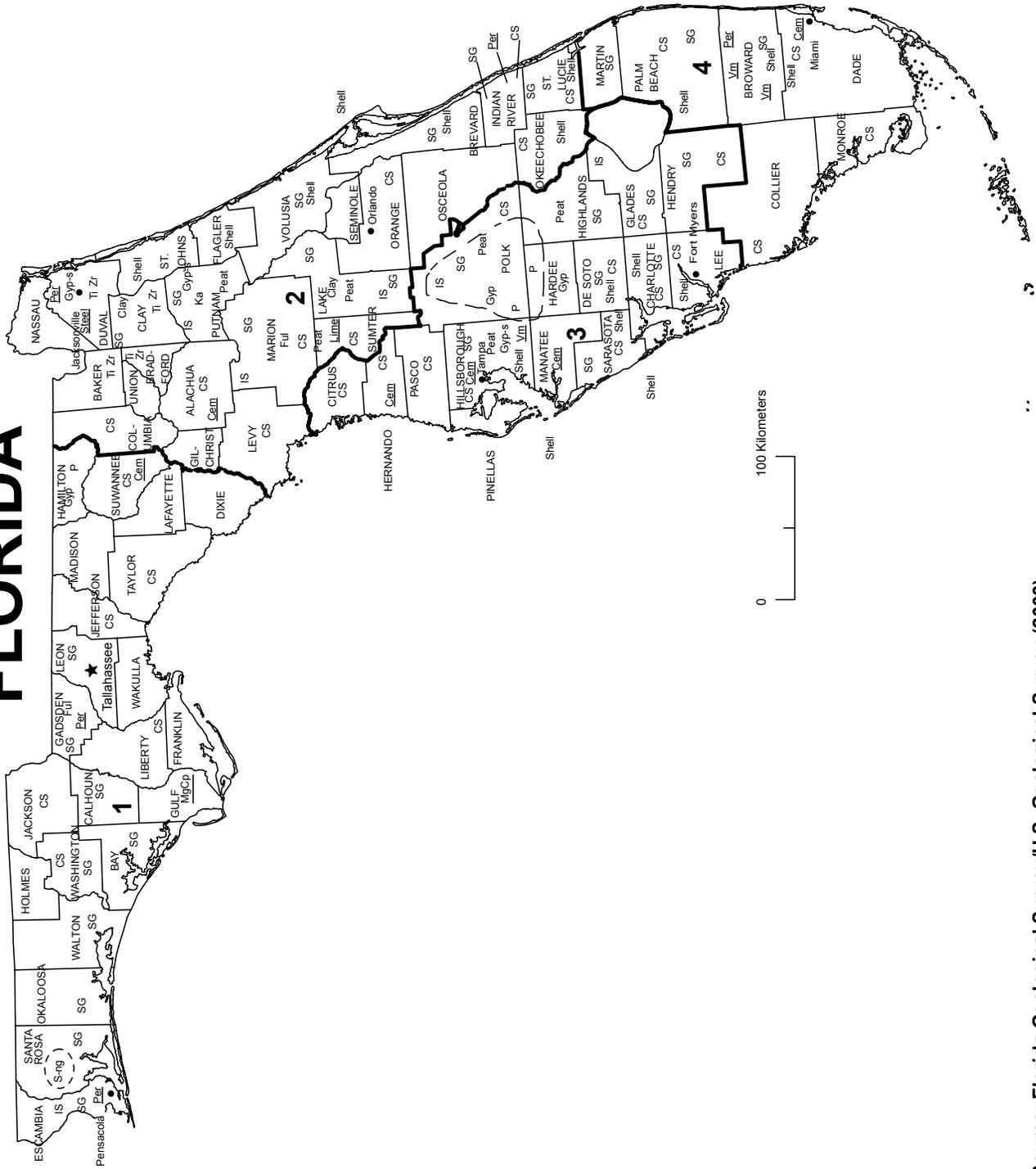


# FLORIDA



## LEGEND

- County boundary
- ★ Capital
- City
- 1 — Crushed stone/sand and gravel districts

## MINERAL SYMBOLS (Major producing areas)

- Cem Cement plant
- Clay Common clay
- CS Crushed stone
- Ful Fuller's earth
- Gyp Gypsum
- Gyp-s Synthetic gypsum
- IS Industrial sand
- Ka Kaolin
- Lime Lime plant
- MgCp Magnesium compound plant
- P Phosphate rock
- Peat Peat
- Per Perlite plant
- S-ng Sulfur (natural gas)
- SG Construction sand and gravel
- Shell Shell
- Steel Steel plant
- Ti Titanium minerals
- Vm Vermiculite plant
- Zr Zirconium
- (dashed circle) Concentration of mineral operations

# THE MINERAL INDUSTRY OF FLORIDA

**This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Florida Geological Survey for collecting information on all nonfuel minerals.**

In 2003, the estimated value<sup>1</sup> of nonfuel mineral production for Florida decreased to about \$2 billion, based upon preliminary U.S. Geological Survey (USGS) data. This was an about a 1.5% decrease from that of 2002<sup>2</sup> and followed a nearly 13% increase in value in 2002 from that of 2001. The State ranked fifth (fourth in 2002) among the 50 States in total nonfuel mineral production value, of which the State accounted for more than 5% of the U.S. total.

Florida continued to lead the Nation in phosphate rock mining in 2003 by producing more than six times as much as the State with the next highest production. Phosphate rock is produced in only four States. In terms of value, phosphate rock, crushed stone, cement (portland and masonry), and construction sand and gravel continued to be the most important raw nonfuel mineral commodities produced in Florida. The dollar value of these four mineral commodities and the next highest commodity value, for titanium concentrates (ilmenite and rutile), represented about 93% of the State's total nonfuel mineral value. In 2003, the State's nonfuel mineral value decreased mostly owing to a dropoff in the production and value of phosphate rock, down about \$70 million, and to zirconium concentrates, down about \$8 million. These decreases were offset, in part, by the rising values of portland cement, crushed stone, and construction sand and gravel (descending order of change) (table 1).

In 2002, the production and value of most nonfuel minerals increased, although several were unchanged. Phosphate rock rose by nearly \$150 million; crushed stone, by \$58 million; construction sand and gravel, by \$5 million; and industrial sand and gravel, by about \$1 million. For several other nonfuel minerals, such as fuller's earth, production decreased, but values increased from those of 2001. Among the commodities with low production but increased value were zirconium concentrates (up by \$8 million), cement (portland and masonry) (up more

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<sup>1</sup>The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2003 USGS mineral production data published in this chapter are preliminary estimates as of July 2004 and are expected to change. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Specialist contact information may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals/contacts/comdir.html>; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

<sup>2</sup>Values, percentage calculations, and rankings for 2002 may differ from the Minerals Yearbook, Area Reports: Domestic 2002, Volume II, owing to the revision of preliminary 2002 to final 2002 data. Data for 2003 are preliminary and are expected to change; related rankings also may change.

than \$4 million), and ilmenite (up \$3 million). Staurolite production was down about 15%, but its value decreased by only about 6%.

Based upon USGS estimates of the quantities produced in the 50 States in 2003, Florida continued to be the only State to produce rutile concentrates and staurolite and continued to rank first in the production of phosphate rock and peat, first of two States that produced ilmenite concentrates and zirconium concentrates, third in magnesium compounds, fourth in fuller's earth, and seventh in portland cement. While Florida led the States in the production of masonry cement (second in 2002) and rose to second from third in crushed stone, it decreased to seventh from fourth in the production of fuller's earth. Additionally, Florida produced significant quantities of construction and industrial sand and gravel.

The Florida Geological Survey<sup>3</sup> (FGS) provided the following narrative information. Production and other data in the following text are those reported by the FGS, based upon that agency's own surveys and estimates. The FGS data may differ from some production figures reported to the USGS. The largest portion of Florida's nonfuel mineral value came from the production of phosphate rock, in which Florida, based on FGS estimates, accounted for approximately 75% of the Nation's production and 25% of the world's production. The Florida Phosphate Council reported that in 2003, more than 28 million metric tons of phosphate rock was extracted from 1,821 hectares (ha) of land. Commodities that also contributed significantly to the State's nonfuel mineral production figures included crushed limestone, heavy-mineral sands, masonry and portland cement, peat, and clay.

Demand for aggregates was at an all-time high. In early 2004, however, the construction industry was hampered by an inadequate supply of materials; shortages of aggregates, cement, and steel happened somewhat concurrently.

The Mine Safety and Health Administration (MSHA) reported that in 2003, 6,978 persons were employed in Florida's surface mining operations; this number does not take into account contractors that may be working for some operators. The crushed stone industry employed 2,683 workers, and the phosphate industry employed 2,214 workers. The remainder of the workforce was employed by sand and gravel, cement, heavy-mineral sands, and clay mining operations.

## Exploration and Development

The Florida Department of Environmental Protection, Bureau of Mine Reclamation issued permits to the following crushed limestone operations: Alico LLC, West Lakes Excavation, a 208-ha mine in Lee County near Fort Myers; East Naples Land

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<sup>3</sup>Steven Spencer, Coastal/Economic Geologist, authored the text of the State mineral industry information provided by the Florida Geological Survey.

Company, East Naples Mine, a 67-ha tract at a 688-ha mine near South Golden Gates, Collier County; Concrete Structures Inc., a 4.5-ha site in the Lake Belt of Miami-Dade County; and Rinker Materials Inc.'s 109-ha WuKrome Mine in Miami-Dade County. These may be new mines and/or mine expansions, but most had not begun mining operations at yearend.

Although exempt from permits from the Florida Bureau of Mine Reclamations, Carabelle Rock LLC's new crushed stone/shell quarry in Tate's Hell State Forest was fully permitted by the U.S. Army Corp of Engineers. Counts Construction Co. reopened the 79-ha Pansy Britt Mine in Marion County and has renamed it the Diamondback Mine.

In 2002, the FGS and the U.S. Department of the Interior's Minerals Management Service (MMS) entered into a second multiyear program of offshore investigations into the geologic processes and parameters that affect the shore and near-shore zones within the coastal area and the identified and undiscovered offshore sand resources available for beach replenishment. In the first year (2002), the study comprised shallow sediments in Federal waters offshore Nassau and Duval Counties from 5 to approximately 16 kilometers (km) and the sediments on the beaches immediately adjacent to that area. More than 370 km of subsurface acoustic profile data were collected off Nassau and Duval Counties and were interpreted to determine locations thought to have been favorable for the deposition of beach-quality sand. A total of 34 beach sampling locations were identified, and 106 surface samples were collected. Of the 10 offshore seabed grab sample locations visited, grab samples were collected from 9. Three push cores were collected on the ebb tidal delta of the Nassau River. Descriptions were made and grain-size distributions were determined for all beach and offshore seabed grab samples and push cores. A preliminary seismic stratigraphic analysis of the subbottom profiler data collected was completed. Because of the seismic stratigraphic analysis conducted, the area study identified several features indicative of high potential for the occurrence of beach-restoration-quality sand in Federal waters off Duval County. This analysis was discussed with representatives of the U.S. Army Corps of Engineers Jacksonville District Office, and a copy of the preliminary work map that delineated those features was provided to them. The study then selected 45 locations in the study area of particular interest for vibracoring in the second year. The results of the tasks completed in the first year of this investigation were detailed in the draft document entitled "A Geological Investigation of the Offshore Area Along Florida's Northeast Coast Year 1 Interim Report 2002-2003," which is available on the MMS Web site at URL <http://www.mms.gov/sandandgravel/florida.htm>.

In 2003, the FGS continued this program of offshore investigations in cooperation with the MMS. Data collection concentrated primarily on the areas offshore Nassau and Duval Counties and the northern half of St. Johns County from 5 to approximately 16 km offshore and the sediments on the beaches immediately adjacent to that area. During the second year, more than 305 km of seismic data were collected and interpreted to determine locations thought to be favorable for the deposition of beach-quality sand. A total of 63 beach sampling locations

in St. Johns and Flagler Counties was identified, and 127 points were sampled. Fifty-five vibracores were collected offshore Nassau and Duval Counties. The FGS is currently preparing the second-year report.

## **Commodity Review**

### ***Industrial Minerals***

Cargill Crop Nutrition acquired the Wingate Creek phosphate rock mine from the holding company for bankrupt NuGulf Industries Inc. and was in the process of reopening the mine. Cargill Crop Nutrition Global Inc. and IMC Global announced the creation of a new company (Mosaic Co.) in which Cargill will own 51% and control more than 60% of phosphate rock production capacity in Florida.

High-purity limestone is used to manufacture the clinker for portland and masonry cement. Florida was a major producer and consumer of both types of cement in 2003. Whereas limestone is mined in several counties throughout the State, cement clinker was produced only in Alachua, Dade, Hernando, and Suwannee Counties. Cement plants, which were primarily grinding plants that used imported clinker, operated in Hillsborough and Manatee Counties.

Fuller's earth, common clays, and kaolin were mined in several locations in Florida in 2003. Fuller's earth, which was mined in Gadsden and Marion Counties, is typically used as an absorbent material; kaolin, which was mined in Putnam County, is used in the manufacture of paper and refractories. Common clays were mined mostly in Clay and Lake Counties and in small quantities from various locations throughout the State.

E.I. du Pont de Nemours & Co. Inc. and Iluka Resources Inc. continued to operate heavy-mineral sand mines in Baker, Bradford, Clay, and Duval Counties. Ilmenite, leucoxene, rutile, and zircon are the primary minerals of interest in the heavy-mineral sand deposits of this region. Ilmenite and rutile are the primary ingredients in the manufacture of titanium dioxide pigments, which, in turn, are used in the manufacture of lacquers, paint, paper, plastics, and varnish.

### **Environmental Issues and Reclamation**

In 2003, the Bureau of Mine Reclamation issued 33 Environmental Resource Permits (ERP) and 10 Wetland Resource Permits, accounting for about 9,000 ha of upland and wetland disturbance; mine expansions and modifications were included in this total.

Since July 1, 1975, Florida law has required that all mined lands be reclaimed. In the past 10 years, \$326 million has been spent on mandatory as well as other related reclamation projects. Mined land has been reclaimed for agricultural, commercial, industrial, recreational, and residential purposes and as sanctuaries for birds and other wildlife. Since 1980, more than 30 million trees have been planted on reclaimed lands. The mining companies have also donated thousands of acres of land to State and public entities for recreation and wildlife habitat. The industry has continued to work with the Florida Department of Environmental Protection and other State

and Federal agencies to protect and to restore ecosystems and to benefit wildlife (Florida Phosphate Council, 2004§<sup>4</sup>).

The following entities were operating and had reclamation responsibility in Florida as of January 1, 2003: IMC Phosphates; Cargill Crop Nutrition; CF Industries, Inc.; and PCS Phosphate. The following companies maintained reclamation responsibility under Florida law at the beginning of 2003: Agrifos LLC, Brewster Phosphates, Estech, Inc.; Florida Power Co., ExxonMobil Corporation, NuGulf Industries Inc.; TECO Energy Inc.; USS AgriChemicals, and the Williams Co.

### **Governmental Programs**

The third annual Mining Day took place at Florida's State Capitol in 2003. This event was jointly sponsored by the aggregates, phosphate, heavy-minerals, and clay industries in Florida in an attempt to bring awareness of the importance of mining to decisionmakers.

The aggregates industry in Florida kicked off a public education program in the elementary schools of several targeted communities. This program, which has received the approval of the State's Department of Education science curriculum section, should be fully in place by the opening of the 2004 fall term. The program goal is to enhance the science curriculum with more mineral science and mining recognition at the fourth grade level. The program will be supported by volunteers from

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<sup>4</sup>A reference that includes a section mark (§) is found in the Internet Reference Cited section.

local aggregate mining companies who will donate classroom materials and provide mentoring assistance.

As part of an ongoing cooperative effort through the STATEMAP component of the National Cooperative Geologic Mapping Program, the FGS completed geologic mapping for the eastern portion of the USGS 1:100,000-scale Marianna quadrangle and completed the final maps and cross sections for the same area. The completed maps and cross sections are available as part of the FGS Open-File Map Series (OFMS 92). The FGS is presently mapping the geology of the western portion of the Gainesville quadrangle at a scale of 1:100,000 and planned to publish a geologic map and several geologic cross sections by September 2004 as OFMS 93.

Some FGS publication highlights included a CD-ROM about a workshop to develop blueprints for the protection of Florida's springs, a report on Florida's freshwater spring classification system, a poster on Florida's sinkholes, and an open-file report on the geology of Suwannee County. Information on obtaining these and other new FGS publications may be found on the FGS Web site at URL <http://www.dep.state.fl.us/geology/>.

### **Internet Reference Cited**

Florida Phosphate Council, 2004, 2004 Florida phosphate facts, accessed August 27, 2004, at URL <http://www.flaphos.org/fact2004.pdf>.

TABLE 1  
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

Mineral	2001		2002		2003 <sup>P</sup>	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	556	62,600 <sup>e</sup>	591	64,000 <sup>e</sup>	600	64,200 <sup>e</sup>
Portland	4,060	294,000 <sup>e</sup>	3,950	297,000 <sup>e</sup>	4,200	317,000 <sup>e</sup>
Clays:						
Common	94 <sup>e</sup>	1,280 <sup>e</sup>	W	W	W	W
Fuller's earth	334 <sup>e</sup>	22,200 <sup>e</sup>	W	W	W	W
Kaolin	32	3,380	32	3,370	32	3,370
Gemstones	NA	1	NA	1	NA	1
Peat	544	11,300	559	11,500	434	8,920
Sand and gravel:						
Construction	24,800	109,000	26,400	114,000	29,000	125,000
Industrial	598	7,510	645	8,640	826	9,150
Stone, crushed	95,100	515,000	97,700	573,000	98,200	589,000
Combined values of magnesium compounds, phosphate rock, staurolite, titanium concentrates, zirconium concentrates, and values indicated by symbol W	XX	770,000	XX	963,000	XX	888,000
Total	XX	1,800,000	XX	2,030,000	XX	2,000,000

<sup>e</sup>Estimated. <sup>P</sup>Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

<sup>1</sup>Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2  
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND<sup>1</sup>

Kind	2001				2002			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone <sup>2</sup>	78	92,100	\$497,000	\$5.39	76	95,900	\$561,000	\$5.85
Dolomite	5	1,820	12,500	6.87	5	1,200	8,540	7.13
Shell	4	1,160	6,060	5.24	3	611	3,900	6.38
Total or average	XX	95,100	515,000	5.42	XX	97,700	573,000	5.87

XX Not applicable.

<sup>1</sup>Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

<sup>2</sup>Includes limestone-dolomite reported with no distinction between the two.

TABLE 3  
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2002, BY USE<sup>1</sup>

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
<b>Construction:</b>			
<b>Coarse aggregate (+1 1/2 inch):</b>			
Macadam	W	W	13.23
Riprap and jetty stone	94	1,010	10.69
Filter stone	195	1,740	8.92
Other coarse aggregates	2,040	22,200	10.89
Total or average	2,330	25,000	10.72
<b>Coarse aggregate, graded:</b>			
Concrete aggregate, coarse	1,860	16,400	8.84
Bituminous aggregate, coarse	W	W	9.92
Bituminous surface-treatment aggregate	W	W	10.20
Other graded coarse aggregates	16,300	125,000	7.67
Total or average	18,100	141,000	7.79
<b>Fine aggregate (-3/8 inch):</b>			
Stone sand, concrete	1,310	10,100	7.71
Stone sand, bituminous mix or seal	W	W	7.99
Screening, undesignated	525	3,700	7.05
Other fine aggregates	9,070	68,400	7.54
Total or average	10,900	82,200	7.54
<b>Coarse and fine aggregates:</b>			
Graded road base or subbase	8,820	38,800	4.40
Unpaved road surfacing	W	W	5.24
Crusher run or fill or waste	5,990	30,900	5.17
Other coarse and fine aggregates	8,180	40,000	4.89
Total or average	23,000	110,000	4.78
Other construction materials	13	44	3.38
Agricultural limestone	227	1,690	7.46
<b>Chemical and metallurgical:</b>			
Cement manufacture	(2)	(2)	4.41
Sulfur oxide removal	(2)	(2)	11.65
Other miscellaneous uses and specified uses not listed	19	159	8.37
<b>Unspecified:<sup>3</sup></b>			
Reported	30,900	151,000	4.90
Estimated	10,000	52,000	5.04
Total or average	41,200	203,000	4.94
Grand total or average	97,700	573,000	5.87

W Withheld to avoid disclosing company proprietary data; included with "Other."

<sup>1</sup>Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

<sup>2</sup>Withheld to avoid disclosing company proprietary data; included in "Grand."

<sup>3</sup>Reported and estimated production without a breakdown by end use.

TABLE 4  
 FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2002, BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1 1/2 inch) <sup>2</sup>	W	W	102	774	W	W
Coarse aggregate, graded <sup>3</sup>	W	W	W	W	5,730	60,600
Fine aggregate (-3/8 inch) <sup>4</sup>	W	W	W	W	3,880	33,200
Coarse and fine aggregate <sup>5</sup>	W	W	8,380	33,900	5,910	31,200
Other construction materials	--	--	--	--	--	--
Agricultural <sup>6</sup>	W	W	W	W	W	W
Chemical and metallurgical <sup>7</sup>	--	--	--	--	W	W
Other miscellaneous uses and specified uses not listed	--	--	11	80	--	--
Unspecified: <sup>8</sup>						
Reported	1,530	7,330	1,700	8,380	2,500	12,200
Estimated	1,100	5,200	2,500	12,000	1,700	8,000
Total	3,790	24,700	13,300	60,000	23,000	172,000
	District 4		Unspecified district			
	Quantity	Value	Quantity	Value		
Construction:						
Coarse aggregate (+1 1/2 inch) <sup>2</sup>	W	W	--	--		
Coarse aggregate, graded <sup>3</sup>	W	W	--	--		
Fine aggregate (-3/8 inch) <sup>4</sup>	6,850	46,700	--	--		
Coarse and fine aggregates <sup>5</sup>	8,010	39,300	10	84		
Other construction materials	13	44	--	--		
Agricultural <sup>6</sup>	--	--	--	--		
Chemical and metallurgical <sup>7</sup>	--	--	200	2,330		
Other miscellaneous uses and specified uses not listed	8	79	--	--		
Unspecified: <sup>8</sup>						
Reported	25,100	123,000	--	--		
Estimated	5,000	27,000	--	--		
Total	57,400	314,000	210	2,420		

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

<sup>3</sup>Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and other graded aggregates.

<sup>4</sup>Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

<sup>5</sup>Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

<sup>6</sup>Includes agricultural limestone.

<sup>7</sup>Includes cement manufacture and sulfur oxide removal.

<sup>8</sup>Reported and estimated production without a breakdown by end use.

TABLE 5  
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2002,  
BY MAJOR USE CATEGORY <sup>1</sup>

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	7,980	\$39,500	\$4.96
Concrete products (blocks, bricks, pipe, decorative, etc.) <sup>2</sup>	732	3,090	4.22
Asphaltic concrete aggregates and road base materials	688	2,100	3.05
Fill	3,530	7,810	2.21
Other miscellaneous uses	474	3,910	8.24
Unspecified: <sup>3</sup>			
Reported	7,610	34,800	4.58
Estimated	5,400	22,000	4.07
Total or average	26,400	114,000	4.29

<sup>1</sup>Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

<sup>2</sup>Includes plaster and gunite sands.

<sup>3</sup>Reported and estimated production without a breakdown by end use.

TABLE 6  
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2002, BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products <sup>2</sup>	559	2,460	3,850	18,900	4,300	21,300
Asphaltic concrete aggregates and road base materials	20	35	W	W	W	W
Fill	465	994	1,090	1,960	1,670	4,050
Other miscellaneous uses	2	10	696	2,740	431	3,160
Unspecified: <sup>3</sup>						
Reported	169	1,110	4,080	20,100	3,360	13,600
Estimated	1,800	7,100	2,300	9,500	900	3,500
Total	3,010	11,700	12,000	53,200	10,600	45,600
	District 4					
	Quantity	Value				
Concrete aggregate and concrete products <sup>2</sup>	--	--				
Asphaltic concrete aggregates and road base materials	--	--				
Fill	310	808				
Other miscellaneous uses	13	59				
Unspecified: <sup>3</sup>						
Reported	--	--				
Estimated	500	2,200				
Total	778	3,040				

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Includes plaster and gunite sands.

<sup>3</sup>Reported and estimated production without a breakdown by end use.